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(71) Applicant(s)
Thomas Minto Russell
1 Hilbre Drive, SOUTHPORT, Merseyside, PR9 7JT, United Kingdom

(72) Inventor(s)
Thomas Minto Russell

(74) Agent and/or Address for Service
Thomas Minto Russell
1 Hilbre Drive, SOUTHPORT, Merseyside, PR9 7JT, United Kingdom

(54) Abstract Title
Spring assisted rising butt hinge

(57) A self dosing hinge for closing a barrier 90 comprising a cam mechanism 20 having first 30 and second 40 mating cam sections, and means for biasing, e.g. a compression coil spring 180, one cam section 30 against the other 40, in which the first 30 and second 40 cam sections are adapted such that on opening the barrier, rotation of the first cam section 30 against the second cam section 40 raises the first cam section 30 against the weight of the barrier 90 and against the biasing means 180 and such that the closure force, once the barrier 90 is released, is provided at least in part by the weight of the barrier 90 and the biasing means 180. The cam 20 may be pre-loaded to provide a closing force when the barrier 90 is in the closed position by tightening a bolt 210 on the threaded portion 200 of rod 210, to compress spring 180. Rod 110 is fixedly secured to second cam 40 by a pin 140. The hinge may be located within a cylindrical safety cover 220.

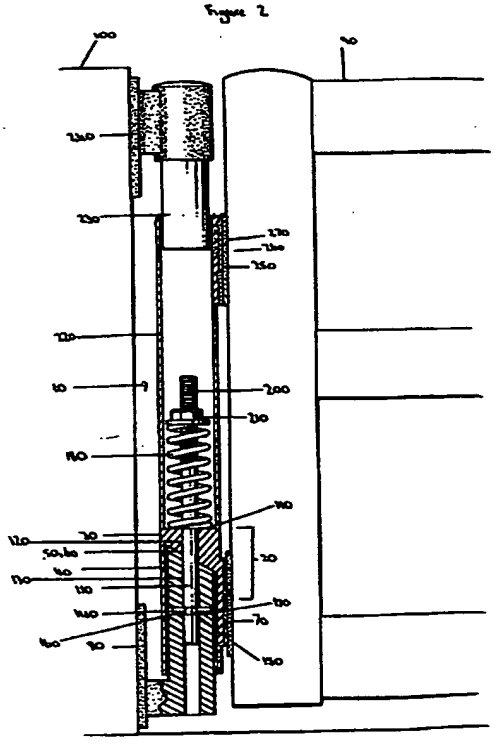

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Figure 1

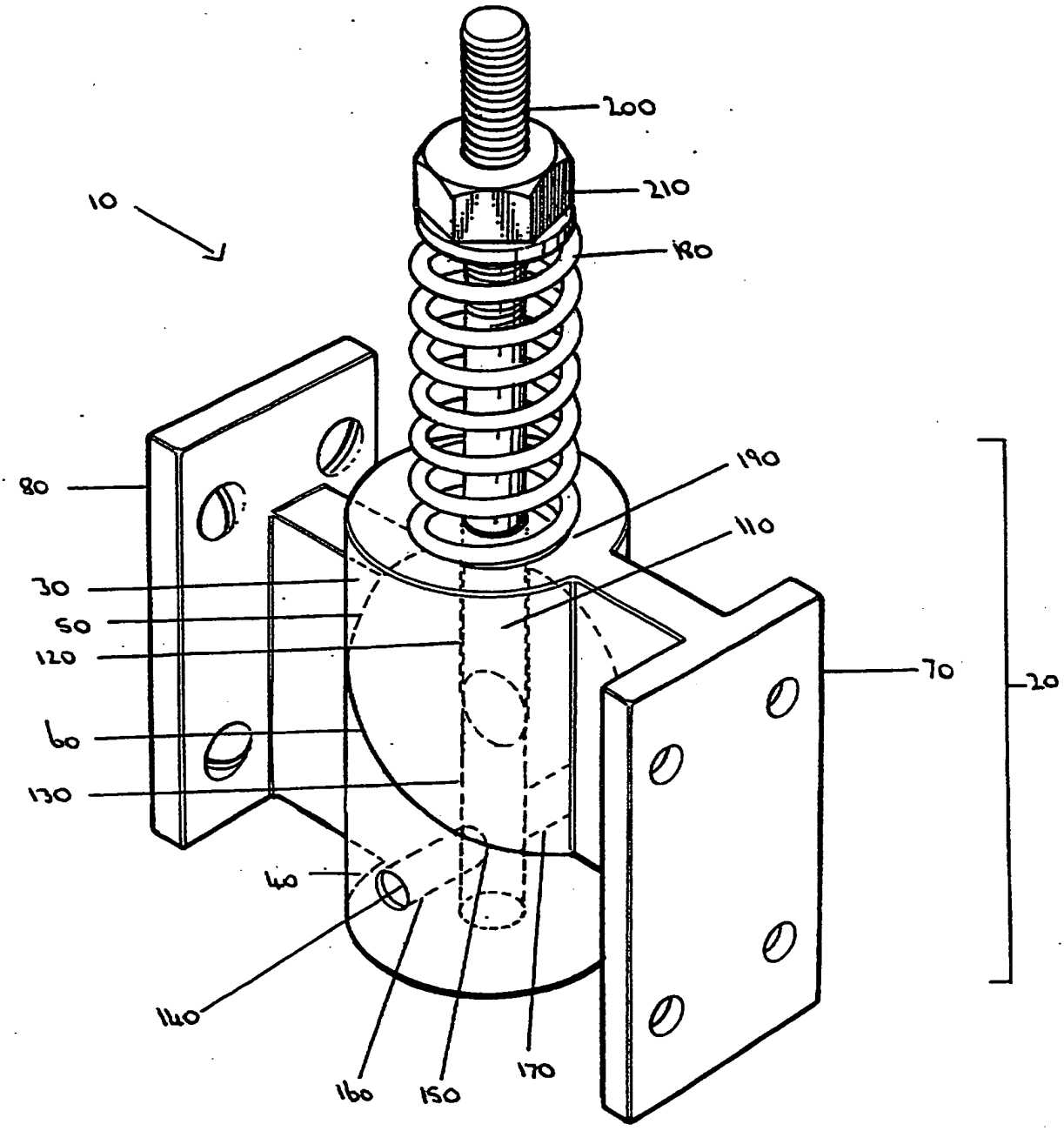
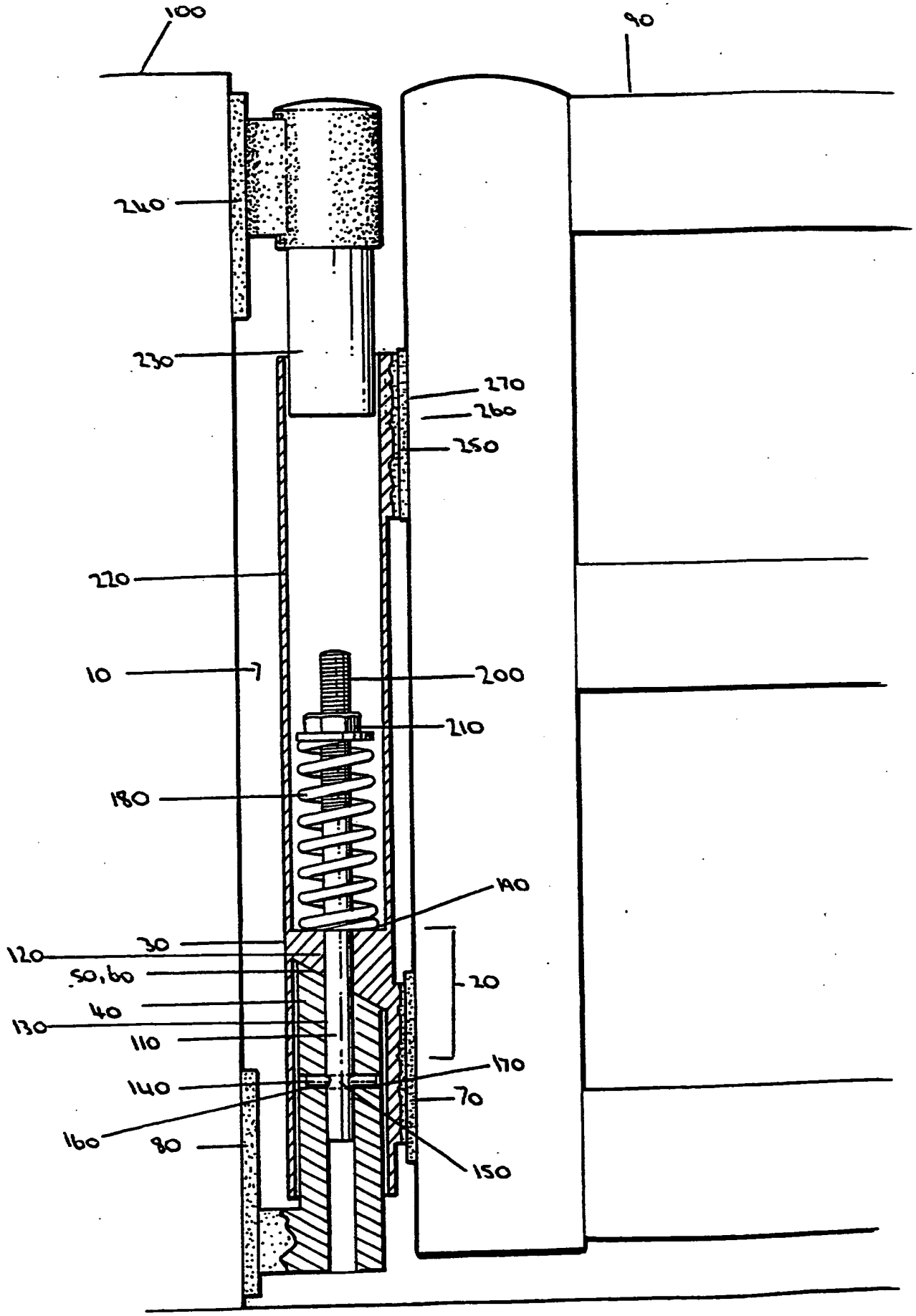


Figure 2 2/2


100
90
240
230
270
260
250
220
10
7
200
210
180
190
120
30
50,60
40
130
110
20
170
140
70
160
80
150

DESCRIPTION

A SELF CLOSURE HINGE

The present invention relates to a self closure hinge, namely a hinge which will return a barrier to which it is attached, such as a gate or door, to a central, closed position when the barrier is rotated about the hinge to an open position, for example when a person passes through a doorway or gateway, and then released.

Barrier self closure devices and assemblies are widely used where it is necessary to ensure that doors and gates remain closed, for example, to prevent children or animals from wandering through open doors or gates, or to prevent the spread of noxious smoke and flames during a fire.

Depending on the circumstances of use, the self closure device or assembly may be used in conjunction with a latch which releasably locks the barrier in its closed position when the barrier is opened and then released.

One type of known self closure assembly simply comprises a coiled spring (or springs) attached between a barrier support and a hinged barrier. When the barrier is opened, it rotates about the hinge and stretches the spring(s), which then provides the closure force to return the gate to the closed position.

A problem with this type of closure device is that the spring must be sufficiently flexible to allow the barrier to be opened, but the return force provided must be great enough to return the barrier positively to its closed position. It is often found that the force provided by a sufficiently flexible

spring, particularly when a large barrier is used, is often inadequate to return the barrier quickly to the closed position, that is, with a positive closure action. Secondly, as the spring is stretched each time the barrier is opened, fatigue is likely to occur, which leads to a reduction in the return force provided by the spring over time. Thirdly, the exposed spring is a potential safety hazard, particularly to children who may trap their fingers between the coils.

One type of self closure device is presently sold under the trademark "Noreg". In this device a spring is housed vertically between the barrier and support. One end of the spring is secured to a fixed portion of the housing and the other end is attached to a pivoted portion. The pivoted portion is attached to the barrier such that the barrier's displacement from the closed position causes the spring to twist (torsion). The return force to close the barrier is therefore provided by the untortioning of the spring.

The return force can be varied to a limited degree, to accommodate an increase in barrier weight, by partially tortioning the spring when the barrier is in the closed position. However, it has been shown that with such an arrangement, it is often difficult to achieve the correct degree of pre-tortioning to obtain the desired return force for gates of varying weights i.e. to achieve a positive closure action.

A third type of self closure device relies on pneumatic pressure to provide the return force for the barrier. One example is sold under the "Airclo" trademark.

Here the barrier is coupled to a piston and cylinder such that movement of the barrier from the central position moves the piston in the cylinder. The pressure differential produced in the cylinder provides the requisite force to return the barrier to the central position when it is released.

Unfortunately, there are drawbacks with this design in that it is difficult, if not impossible, to vary the closure force provided by each unit and furthermore, a convenient surface must be found either on the barrier or adjoining wall on which to mount the cylinder.

There is therefore a need for a self closure hinge which overcomes the problems associated with the prior art.

In accordance with the present invention there is provided a self closure hinge for returning a barrier from an open to a closed position, comprising a cam having first and second mating cam sections, first and second attachment means to attach said first and second cam sections to the barrier and a support respectively, and a means for biasing one cam section against the other, in which the first and second cam sections are adapted such that, on opening the barrier, rotation of said first cam section against said second cam section raises said first cam section against the weight of the barrier and the biasing means and such that the closure force, once said barrier is released, is provided at least in part, by the weight of the barrier and the biasing means.

The shape and configuration of the mating cam sections, required to translate the rotational motion of the barrier and first cam section into

vertical displacement will be obvious to the skilled person. As examples only, the two mating sections may form a butt cam or one threaded cam section may rotate in, or on, the thread of the other.

As the first cam section is attached to the barrier, the weight of the barrier bears, through the first cam section, onto the second cam section. The configuration of the mating surfaces of the cams is such that, when the barrier is opened, a component of the weight of the barrier is translated into an opposing closure force. When the barrier is released, this force causes the first cam section to rotate downwardly on the second cam section to close the barrier. The closure force is therefore proportional to the barrier weight.

However, problems arise in a "cam only" self closure hinge due to the inherent frictional forces acting between the moving parts of the closure hinge, e.g. the upper and lower cam sections, which reduce the closure force for a given barrier weight.

It has therefore been found by the applicants that providing additional biasing means on the cams may compensate for this loss in closure force and provide a more positive closure action.

Preferably the loading (force) provided by the biasing means is adjustable and allows a load to be applied to the first cam even when the barrier is closed.

Suitable biasing means will be obvious to the skilled person and may include a resilient member which is arranged to effect a load on the first cam section. It may optionally, but not necessarily be attached directly or

indirectly to, or bear upon, a cam section.

The biasing means may be, for example, a spring which is attached to, in contact with, or coupled to a cam section such that the spring is compressed or tensioned when the first cam section rotates and is raised up on the second cam section.

The qualities of a spring under compression make it particularly suited for use as a biasing means in the present invention. It has been found that, unlike with some other types of resilient member, initial compression or tension of a spring produces a load, but that the load is not markedly increased by further compression or tension. Use of a spring type biasing means therefore facilitates the application of an almost constant additional closure force to be first cam section (over that provided by the weight of barrier acting through the cam section) which results in a smooth, but positive, closure action.

An advantage of the self closure hinge of the present invention is that a positive closure action can be achieved on a wide range of gate weights without the need to change the loading of the biasing means. As the closure force is proportional to the barrier weight, it has been found that the additional load, on the cam, required to produce a positive closure action, does not have to be too great or vary markedly.

By way of example only, two specific embodiments of the present invention will now be described with reference to the accompanying drawings, in which;

FIG. 1 is a perspective view from the front and side of one embodiment of a self closure hinge in accordance with the present invention; and

FIG. 2 is a part cross sectional view of another embodiment of a self closure hinge according to the present invention attached to a support and a gate.

Referring to both Figures 1 and 2, the hinge 10 comprises a butt cam 20 having upper 30 and lower 40 cam sections which comprise complementarily inclined and abutting cam surfaces 50,60. Each cam section 30,40 has a bracket 70,80 integrally formed therewith for attachment to a gate 90 and a support 100, respectively (see Figure 2). The bottom half of a cylindrical rod 110 passes through aligned central bores 120,130 located along the common vertical axis of each cam section 30,40.

The rod 110 is fixedly secured to the lower cam member 40 by means of a pin 140 passing horizontally through both an aperture 150 in the rod 110 and two complementarily positioned apertures 160,170 in the lower cam 40.

A spring 180 is positioned around the upper exposed portion of the rod 110 such that it rests against the upper surface 190 of the upper cam section 30.

A top portion 140 of the rod 110 is provided with a screw thread 200, onto which a tightening bolt 210 is screwed so that it abuts the top of spring 180. By screwing the bolt 210 further onto the rod 110 the spring may

be partially compressed against the upper surface 190 of the upper cam section 30 providing a pre-loading on the cam 20.

Referring to Fig. 2, this embodiment comprises additional features over and above the embodiment of Fig. 1 which allow the hinge to support larger gates.

In the embodiment of Fig. 2, the upper cam section 30 is integrally formed within a cylindrical cover 220. The cover 220 extends downwards to snugly locate around the side wall of the lower cam section 40 and upwards to locate around a vertically disposed rod 230 attached to the support 100 by a third bracket 240. A fourth bracket 250 is formed on an upper region 260 of the cylindrical cover 220 for attachment to an upper side region 270 of the gate 90.

In operation, referring to both Figs. 1 and 2, the bolt 210 is optionally screwed onto rod 110 so that the spring 180 is under compressive load. The pre-load can be set at the factory if desired.

When the gate 90 (see Fig. 2) is opened by rotation about the hinge 10, the upper cam section 30 rotates (pivots) on lower cam section 40. As this happens the periphery of the upper cam section mating surface 50 rides up on the periphery of the lower cam section mating surface 60, raising the upper cam section 30 against the weight of the gate 90 and the loading of the spring 180. When the gate 90 is released, the weight of the gate 90 bears, through the upper cam section 30, on the lower cam section 40. This combined with the loading of the spring 180 causes the cam to rotate

downwardly closing the gate 90.

With regard to the embodiment of Fig. 2, as the upper cam 30 rotates and is raised or lowered, the cylindrical cover 220 rotates around the lower cam section 40 and upper support rod 230.

Alternatively, a pre-load does not have to be applied to the upper cam section 30 by the spring 180. However a load will be applied by the spring 180 as the upper cam section 30 is raised.

Alternative embodiments of the present invention may be illustrated by inverting the accompanying figures. However the gate 90 must be attached to the upper cam section 30 and the support 100 to the lower cam section 40 as then configured.

The invention is not restricted to the details of the foregoing embodiments and includes variants which would be obvious to the skilled person, for example, in the embodiment of Fig. 2, the cylindrical cover 20 may not be integrally formed with the upper cam section 30, but may instead be detachably fixed.

Attachment means suitable for the present invention will be obvious to the skilled person.

Any features of the specific embodiments are interchangeable with any other features mentioned in the specification.

CLAIMS

1) A hinge for a gate or barrier which stores the energy used in the opening process to provide a closing force to return the barrier to the starting position

2) The main energy store as claimed in claim 1 is provided during the opening operation which automatically lifts the gate/barrier thus giving potential energy used to close it

3) This potential energy as claimed in claim 2 is obtained from a cam fixed to the post and its follower fixed to the gate. This cam arrangement lifts the gate during opening.

4) The operation of the mechanism as claimed in claim 3 is not in every situation sufficient to guarantee successful operation as gate weights are variable. An additional force assists that obtained as claimed in claim 2 deforming a resilient material ; eg a compressed coil spring.

5) The complete mechanism as claimed in claims 1 - 4 is housed inside a circular tube for safety and esthetic reasons. No potential entrapment therefore exists between any component and its adjacent components during the movement of the gate.

6) The safety feature as claimed in claim 5 enables this design to meet the requirement laid done in BS/EN 1176 Design Standard for External Play Equipment.

7) The Self Closure Hinge design allows the gate/barrier to operate in both directions thus giving the benefit enabling the silent operation of the gate/barrier

8) The hinge unit is designed as two variants, one to bolt to the gate and post and the other as a weld-on unit. This enables this product to be supplied either for new installations or as a retro-fit unit for existing gates.

Application No: GB 9802586.9 **Examiner:** David Glover
Claims searched: all **Date of search:** 11 June 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): E2F (FAE, FCD)

Int Cl (Ed.7): E05F 1/02, 1/04, 1/06, 1/08, 1/10, 1/12

Other: Online: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2289085 A	(Requena) see whole document	1-8
X	GB 2281099 A	(Kason) see whole document	1-8
X	GB 2198473 A	(Addie) see whole document	1-8
X	GB 0473705	(Brewer) see whole document	1-8
X	US 4991259	(Kason) see whole document	1-8

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.